Success and cost effectiveness of multi-species projects

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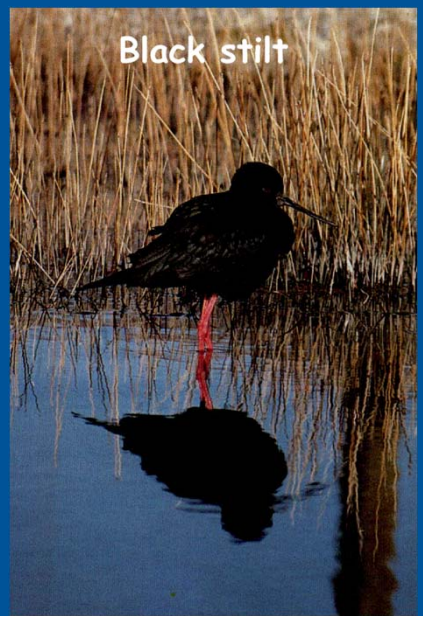
Te Whare Wānaka O Aoraki



OUTLINE

- Problem investigated
- Cost Utility Analysis and COPY
- Success
- Cost Effectiveness Analysis
- Problems and risks
- Policy implications
- Future directions

The Global Problem

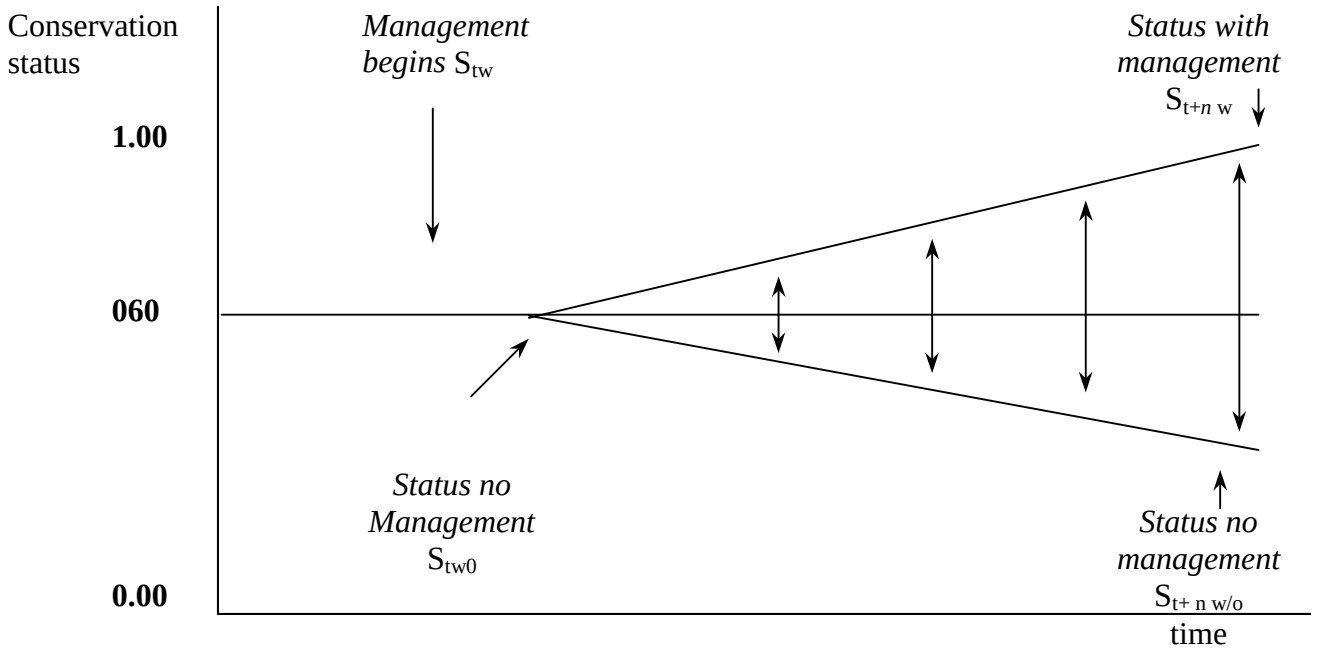
- Species loss is widely recognised as one of the most serious environmental problems nations face.
- There are 7- 20 million species on the planet.
- Expected loss of species in 25 years 140 000 – 5m.
- 2 - 25% of species are at risk. (UNEP; in World Bank, 2000).
- Expenditures on species protection projects are large, e.g., US$280m/annum USA. Are increasing rapidly in NZ, NZ$187 million over 5 years.
- Of 142 nations compared against a wide variety of indicators New Zealand is considered to be performing worst in terms of biodiversity (World Economic Forum 2002)

The Conservation Context in NZ

- New Zealand reported to have 1300 threatened and endangered species.
- About 34 species have 'recovery plans' some operating since at least 1987.
- Biodiversity strategy projects approx NZ $1 billion additional expenditure on biodiversity programs over the next 20 years.
- Obvious challenges, develop methodologies to :
  - aid investment decision-making
  - evaluate the programs and projects.

COST UTILITY ANALYSIS

- Previous applications for single-species programmes.
- Definition and measurement of output needs refinement.
- Output measured by way of status of a species, c.f. a counterfactual (a 'with' versus 'without' approach).
- Conservation Output Protection Year - COPY is measure of output produced.
- COPY is a measure of time varying quality.
- i.e., the summed gain in conservation status 'With Management' compared to 'Without Management'.


Conservation status
1.00
060
0.00
Management begins S_{tw}
Status with management $S_{t+n\ w}$
Status no Management S_{tw0}
Status no management $S_{t+\ n\ w/o}$
time

Success, and Output from projects

- OUTPUT is the number of COPY gained from a multi species project.
- S_{tw} is conservation status in year t with management.
- S_{t-1w} is conservation status in year t-1 with management.
- $S_{tw/o}$ is conservation status in year t without management.
- $S_{t-1w/o}$ conservation status in year t -1 without management
- d is the discount rate.

Measurement of output from projects

- Measurement of output produced by projects is essential to determine if they are successful or not.
- Score assigned to each species depends on function chosen, e.g., linear, quadratic.
- Linear function assumes changes of equal importance e.g., Nationally Endangered to Extinct, same importance as Serious Decline to Nationally Endangered.
- Quadratic function reports greater value to changes at bottom of scale, e.g., a change from NE to E more value than SD to NE.
- Measurement of output produced using continuum from 0.00 to 1.00, and a quadratic function.

Study projects and approach

- We measure success, calculate output, and calculate cost effectiveness for six multi-species projects.
- Three Mainland Islands: Project River Recovery, Hurunui, Rotoiti.
- Three offshore islands: Maud, Tiritiri Matangi, Little Barrier.
- We recognise that projects have multiple goals.

Data collection

- Advised by DOC staff we obtained species status scores, and project cost data from the relevant project planers or managers.
- Some data also obtained from threatened species managers where necessary.
- Structured personal interviews, and a questionnaire used to collect data.
- Managers/planners provided each threatened species status 'With management', and 'Without management' using the conservation status continuum, and quadratic scale.

Results

- Zero COPY indicates there has been no divergence between a species status 'with management', and its 'without management' status.
- For each project we summed the COPY produced by each species, to obtain total project COPY, as our measure of output produced.
- 5 out of 6 multi-species projects have been successful, > 0.00 COPY.
- Little Barrier is the most successful project.
- Rotoiti MI has produced zero COPY.
- Offshore Is. mean COPY = 1.84, MI mean COPY = 0.57

Output from each project, numbers of COPY

Mainland Island		Offshore Island	
Project River Recovery		Maud Island	
Black Stilt	0.07	Maud Island Frog	1.215
Wrybill Plover	0.00	Stephens Island Gecko	0.87
Black Fronted tern	0.02	Giant Weta	?
Robust Grasshopper	0.07	Kakapo	0.00
Total COPY	0.16	Wood pigeon	0.00
		Total COPY	2.085?
Hurunui		Little Barrier Island	
Yellowhead	0.14	North Island Saddleback	1.05
Great Spotted Kiwi	0.00	North Island kokako	0.55
Orange Fronted parakeet	1.04	North Island tuatara	0.00
Yellow Crown parakeet	0.10	Stitchbird	1.39
South Island Kaka	0.00	Total COPY	2.99
Mistletoes	0.00		
Total COPY	1.28		
Rotoiti		Tiritiri Matangi	
South Island kaka	0.00	Takahe	0.09
South Island robin	0.00	Little Spotted Kiwi	0.00
Yellow Crown parakeet	0.00	Brown Teal	0.00
Mistletoes	0.00	Stitchbird	0.06
Total COPY	0.00	North Island kokako	0.00
		Total COPY	0.15

COSTS

Cost estimation tricky but achievable :

- Programs/project implemented together at a site
- Accounting system designed for record keeping not policy analysis
- $ are available in different output classes

Same cost components collected for each program:

- Direct operational costs
- Organisation overhead component
- Staff salaries
- Capital charge

Costs, and cost effectiveness.

Discount rates
(%)

Project	**0**	**3**	**6**	**10**
River Recovery				
PV of Costs	$5133758	$4373811	$3,772,120	$3151261
Annualised cost			$478,278	
Annualised cost/ha			$43.48	
PV per COPY	$32085988	$27336320	$23,575,751	$19695382
Hurunui				
PV of Costs	$104 6271	$963947	$892,760	$811996
Annualiszed Cost			$159,920	
Annualised cost/ha			$13	
PV per COPY	$817399	$753084	$697,469	$634372
Rotoiti				
PV of Costs	$1631540	$1520236	$1,422,720	$1310512
Annualised costs			$387,321	
Annualised cost/ha			$469	
PV per COPY	undefined	undefined	undefined	undefined
Maud Island				
PV of Costs	$3277849	$2742837	$2,342,837	$1949018
Annualised Cost			$241218	
Annualised cost/ha			$754	
PV per COPY			$1,123,662	
Little Barrier Island				
PV of Costs	$1279103	$1105252	$972 ,803	$840539
Annualised Costs			$100,162	
Annualised cost /ha			$36	
PV per COPY	$427 794	$369649	$325,352	$281116
Tiritiri Matangi Island				
PV of Costs	$2347206	$1949414	$1,651,838	$1361288
Annualised Cost			$170078	
Annualised cost/ha			$780	
PV per COPY	$15 648 040	$12996093	$11,012,259	$9075253

Results/implications

- Three projects with small area have annual costs/ha 20x the cost/ha of three large projects.
- Tiritiri Matangi costs 60x more/ha than does Hurunui.
- Annualised costs of projects range: $81,000- $509,000.
- 3 MI projects mean annualised cost 2x that of 3 OI projects, but only 30% of their mean COPY.
- Cost per COPY range: $432, 000 to at least $20million.
- Three projects cost per COPY < $ 1.5m, manage large % of total population of one or more species.
- 6 multi-species c.f. 8 single species programmes (Cullen et al.; 200), shows MS projects have higher cost, less output, & worse cost effectiveness ratios.

Self critique

- We have focused on projects' success at managing threatened species, and recognise projects have multiple goals.
- We have only measured success and cost effectiveness at 3 MI and 3 OI.
- Focus on final rather than intermediate outputs
- Inadequate expenditure data still a big problem

Policy Implications

- Technique provides practical means to evaluate success, productivity, cost effectiveness of projects.
- Information requirements light, even for MS projects.
- Wide divergences in annual costs, output produced, cost/COPY.
- Successful projects manage big% of species, make significant progress cf 'no project'.
- Multi species projects are inferior to single species programmes
- MI projects inferior to OI projects.
- Results useful guide for project selection and resource allocation.

Future Directions

- Operationalise use of CUA.
- Ex ante rather than ex post analysis, via modelling of project success and COPY expected from projects
- Projection of expected costs of species recovery programmes.
- Modelling to determine likely outcomes if follow rules, e.g. most at risk first, K birds first, most unique species first, least cost species first, equal expenditure on all species, etc.